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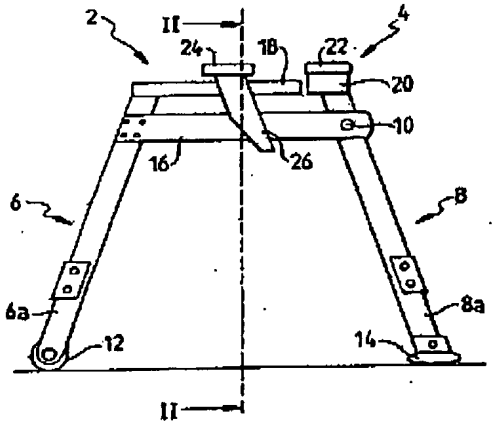
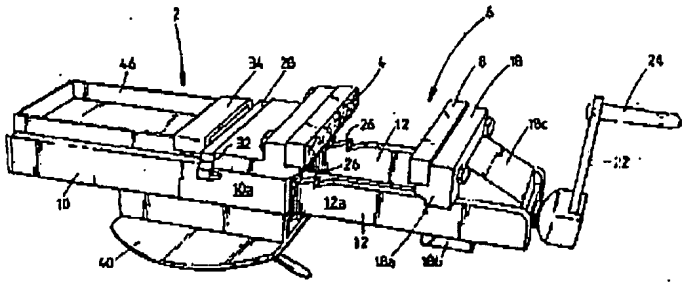
(57) Abstract

A work bench comprises a pair of opposed clamping jaws for holding a workpiece. The jaws are mounted on support legs which are pivotally interconnected in such a manner that the jaws automatically displace one towards the other into a clamping position under a downwards force which can be provided by the self-weight of the device itself and/or by the weight of the workpiece and/or by downwards force applied by the user. A vice has a movable jaw mounted on a slide assembly which can be slid rapidly towards a clamping position to be releasably locked therein by a ratchet and pawl device. Final clamping adjustment of the movable jaw is effected by a screw mechanism. The slide assembly has two laterally-spaced rails which project into a fixed body of the vice. The space between the two rails is unobstructed to permit passage of a vertical workpiece centrally between the jaws.





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CLAMPING DEVICES

The present application relates to clamping devices for holding workpieces. More particularly the application relates to a work bench or a work stool incorporating a clamping device, or to a vice.

Conventional work stools or saw stools have a relatively small working area supported by legs which provide a work surface height about mid-way between that of a chair and a table. Such a height conveniently enables a wide variety of operations to be performed, for example sawing, planing, or drilling of timber and similar operations on non-timber products. Conventional work stools of this type do not usually have means for holding workpieces and it is customary for the workpiece to be held either by applying pressure from one hand or by a knee. This does not provide a secure hold and is also difficult and sometimes dangerous. An alternative is to secure the material with clamps such as D-clamps or G-clamps, but these are not always easy to place with the consequence that the workpiece still might not be held satisfactorily and also the clamps may obstruct access to the workpiece.

There have been proposed folding work benches or work stools comprising a work top composed of opposed jaw-like segments displaceable one towards the other to act in the manner of a vice in order to clamp a workpiece. The jaws are actuated by screw mechanisms resulting in a relatively complex construction which is relatively expensive to manufacture.

According to a first invention there is provided a device for releasably clamping a workpiece, comprising a pair of opposed clamping jaws, and means linking the jaws such that a downwards force on the jaws causes relative movement between the jaws whereby to clamp a workpiece therebetween.

Preferably, the two jaws are each mounted on a respective one of two pivotally interconnected supports such that, in use of the device, lower ends of the supports rest on a support surface, the lower ends of the support being displaceable upwardly one relative to the other under a vertical force applied by the self weight of the device and/or by the workpiece and/or by force applied by the user whereby to cause the jaws to move one towards the other into a clamping position.

One of the supports may include at its lower end roller means to facilitate movement along the support surface.

In a preferred embodiment of the invention, the device forms a work stool or bench, with at least one of the jaws forming a work surface of the stool or bench and the lower ends of the supports resting on the ground. One of the supports may have wheels or rollers at its lower end to roll along the ground and the other of the supports may include feet configured to resist lateral movement along the ground. The feet may be of convex form to facilitate rocking movement of the support on the ground during movement of the jaws.

In one preferred form, one of the jaws may include an adjustable clamping portion adjustable to a selected distance from an opposed clamping portion of the other jaw. In this configuration, the first jaw may define a substantive work surface of the work stool, with the clamping portion being movable to a selected position across the work surface. Preferably the movable clamping portion is infinitely adjustable into a selected position and is preferably also able to adopt a skewed position relative to the clamping portion of the other jaw.

In another preferred form, one of the jaws may itself be adjustable to a selected distance from an opposed clamping portion of the other jaw by a simple sliding action to be locked in its selected position. In this configuration,

the two jaws can define a substantially flat and uninterrupted work surface.

In another embodiment the two jaws have opposed clamping surfaces of stepped configuration whereby to permit workpieces of different widths to be clamped between different clamping portions of the jaws.

The work stool may also be provided with inserts locatable between the jaws to provide profiled clamping surfaces for holding, for example, bars, pipes, or tubes. The work stool can be provided with a substantially flat working surface by means of a rectangular board-like insert locatable between the clamping portion of the two jaws.

Vices conventionally comprise two jaws interconnected by a screw mechanism comprising a screw extending between the jaws and which is rotatable to advance one jaw towards the other and thereby clamp a work piece between the jaws. A standard vice will typically have a large range of adjustment and rotation of the screw to achieve the required spacing can be both time-consuming and tedious. It has been proposed to alleviate these problems by providing a releasable connection between the screw and the inner jaw so that the assembly consisting of the outer jaw and screw can be slid rapidly towards and away from the inner jaw, the connection between the screw and inner jaw then being re-established to permit final clamping adjustment. In such an arrangement, the connection between the screw and inner jaw is formed by half nuts carried by the inner jaw and displaceable radially between an inner position in which the half nuts engage the screw and an outer position in which the half nuts are released from the screw. The use of releasable half nuts requires the incorporation of a mechanism to engage and release the half nuts which adds to the cost and complexity of the vice. It also constitutes a point of structural weakness in the vice. Although in principle the use of releasable half nuts might seem to provide a satisfactory solution to the problems indicated at the outset, it has not obtained widespread acceptance probably for the reasons outlined above. Another

problem may reside in the difficulties in keeping the half nut mechanism free from swarf and other particles and which may impede operation of the mechanism.

Another difficulty which arises in conventional vices, and in vices such as those described above with facility for rapid opening and closing movement, is the presence of the screw which extends centrally between the jaws and which thereby constitutes an obstruction which prevents passage of a workpiece vertically through the vice unless the vice is formed with special jaws offset to permit clamping of vertical workpieces at their outer ends but which does not provide as satisfactory a clamping action as central clamping.

According to a second invention there is provided a clamping device comprising a body part including a first clamping jaw, a slide assembly carrying a second clamping jaw, the slide assembly being mounted on the body part for rectilinear sliding movement between a closed position in which opposed clamping surfaces of the two jaws are adjacent and an open position in which the opposed clamping surfaces of the two jaws are spaced, one from said slide assembly and body part including a ratchet and the other from said slide assembly and body part including a pawl engagable with the ratchet, the ratchet and pawl cooperating to permit movement of the slide assembly towards the closed position of the two jaws with the pawl riding across the ratchet teeth while precluding movement towards the open position without releasing the pawl, whereby the ratchet and pawl cooperate to permit a rapid course adjustment of the spacing between the two jaws, and screw means for causing relative displacement between the first and second jaws whereby to provide fine adjustment of the spacing, the configuration being such that a substantial clamping zone in the centre portion of the two jaws is unobstructed from below by the slide assembly and screw means whereby to permit passage of a workpiece vertically through the clamping zone to extend both above and below the clamping zone in the centre portion of the two jaws.

Embodiments of the inventions will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is an end view of a work stool in accordance with a first preferred embodiment;

Figure 2 is a longitudinal section of the work stool taken on line II-II of Figure 1;

Figure 3 is a fragmentary enlarged side view showing details of an adjustable stop defining the clamping portion of one of the jaws of the work stool;

Figure 4 is an end view of a second embodiment of the work stool;

Figure 5 shows an enlarged detail of Figure 4;

Figure 6 is an end view of a third embodiment of the work stool;

Figure 7 is a side view of the work stool of Figure 6;

Figures 8 and 9 illustrate forms of insert which may be used with the jaws of the work stool of Figures 6 and 7;

Figure 10 is a perspective view of a preferred embodiment of a vice;

Figure 11 is a side view of the vice; and

Figure 12 is a longitudinal section of the vice.

There is shown in Figures 1 to 3 of the accompanying drawings a work bench which is of a height to operate as a work stool or saw stool. The work top of the stool is defined by opposed jaws 2, 4. The jaws 2, 4 are each rigidly mounted at the upper end of a respective support in the form of a frame 6, 8 each having opposed legs 6a, 8a lying at opposite ends of the work stool. The two frames 6, 8 are pivotally interconnected for pivotal movement about an axis 10 extending longitudinally of the work stool and located below the work top such that the weight of each of the jaws 2, 4 plus the weight of a workpiece held by the jaws and any downwards pressure applied by the user to the workpiece and/or the work top will cause the lower ends of the frames 6, 8 to displace outwardly one relative to the other about the axis 10 and the jaws 2, 4 at the upper ends of the frames 6, 8 to displace inwardly one relative to the

other whereby to clamp the workpiece. It will be appreciated that the clamping action is a self-clamping action which does not require a screw threaded mechanism connecting the jaws. In the embodiment shown, the relative outwards displacement of the lower ends of the two frames 6, 8 is facilitated by rollers or wheels 12 at the lower ends of the two legs of one of the frames (as shown in the frame 6). To prevent movement of the stool as a whole and which would be undesirable while working with the stool, the legs of the other frame carry at their lower ends feet 14 which grip firmly against the ground to prevent displacement. When the lower end of the frame 6 displaces outwardly on its wheels or rollers 12 , the frame 8 will tend to pivot or rock about the pivot connection between the two frames and in order to accommodate this movement, the feet 14 are preferably of concave shape which will permit the frame 8 to rock on the ground without displacement along the ground. In order to provide a firm grip between the feet 14 and the ground, the feet 14 are preferably made of a synthetic rubber having a high coefficient friction, with a ribbed or other profiled surface which resists movement along the ground.

In the embodiment shown, the two frames 6, 8 are pivotally connected at the longitudinal pivot axis 10 which passes through the legs 8a of the frame 8, the pivotal connection being made by rigid struts 16 extending from each of the legs 6a of the frame 6 and being bolted or riveted to the corresponding leg of the frame 8 by a single bolt or rivet which defines the pivot axis 10. The struts 16 are rigidly attached to the legs 6a of the frame 6.

In this configuration, the jaw 2 associated with the frame 6 comprises a platform 18 of substantial width to form the major work surface of the stool, the jaw 4 associated with the frame 8 being relatively narrow. This latter jaw comprises a stop portion 20 at the same level as the platform 18, a vertical longitudinal edge 20a of the stop portion 20 abutting against an opposing longitudinal edge 18a of the platform 18 in the fully splayed position of the two frames 6, 8. A fixed clamping portion 22 is mounted above the stop

portion 20 to project slightly over the edge 20a and also to lie above the level of the work surface defined by the platform 18. An adjustable clamping portion 24 in the form of an elongate bar is carried above the platform 18 in such a manner as to be lockable in a selected position relative to the edge 18a of the platform. In effect the clamping portion 24 forms a part of the jaw 4 so as to move with the frame 6, but is adjustable into a selected position over the platform 18. In this manner, a workpiece placed on the platform 18 between the clamping portions 22, 24 can be clamped by the clamping portions upon movement of the two jaws 2, 4 as the lower edges of the frames 6, 8 pivot apart.

The adjustable clamping portion 24 is mounted for movement across the width of the platform 18 to be locked in a selected position relative to the platform 18, the adjustable clamping portion 24 preferably being capable of substantially infinite adjustment so that the spacing between the two clamping portions 22, 24 is adjustable to suit a wide range of thicknesses of workpiece. In the preferred embodiment, the strut 16 at each end of the frame 6, and by which the frame 6 is pivotally connected to the frame 8, is parallel to the platform 18 and forms a convenient mounting for the adjustable clamping portion 24. The adjustable clamping portion 24 is supported at each end on a bracket 26 which is mounted to slide along the adjacent strut 16. The bracket 26 includes a slot 28 within which the strut 16 is received so that the bracket 26 can slide along the strut 16. The depth of the slot 28 is slightly greater than the depth of the strut 16 so that when the bracket is oriented with the plane of the slot 28 substantially perpendicular to the axis of the strut 16, the bracket 26 can slide along the strut 16, but when the bracket 26 is tilted as shown in Figure 3 the upper and lower edges 28a, 28b of the slot 28 will wedge against the edges of the strut 16 so that the bracket 26 jams and locks in position on the strut 16. In the tilted, locked position the adjustable clamping portion 24 is substantially parallel to the platform 18. In order to achieve a high jamming force, the thickness of the portion of the bracket defining the slot 28 is kept to a minimum. The mounting system described permits substantially infinite

adjustment of the clamping portion 24 across the width of the platform 18 while providing a high anchoring force for the clamping portion 24 in its selected position. Although the adjustable clamping portion 24 may be mounted for parallel movement across the platform 18 with its edge always remaining parallel to the edge 18a, the clamping portion may alternatively be mounted to permit skewed movement with its edge inclined to the edge 18a whereby to permit an object of increasing or decreasing thickness to be held between the two clamping portions 22, 24. This effect may be achieved by making the width of the slot 28 in the bracket 26 greater than the thickness of the strut 16 whereby to permit the adjustable clamping portion 24 to be obliquely inclined across the platform 18.

In order to clamp a workpiece to the stool, the workpiece is laid on the platform 18 with one face against the fixed clamping portion 22 and the adjustable clamping portion 24 is moved against the other face of the workpiece. The platform 18 is then grasped and lifted slightly in order to separate the abutting edges 18a, 20a of the two jaws and the adjustable clamping portion 24 is moved into firm engagement with the adjacent face of the workpiece; in the configuration shown, this final movement of the adjustable clamping portion 24 and the slight lifting of the platform 18 can be done by a user at the same time. When the slight lifting force is removed, the downward forces acting on the platform 18 will cause the jaws to move one towards the other whereby the workpiece is securely clamped between the clamping portions 22, 24. Operations such as sawing, planing, or drilling can then be carried out on the workpiece and the natural tendency of the user to place his knee on the stool during such operations will act to increase the clamping force applied to the workpiece. However, for most operations, the self-clamping action provided by the self-weight of the stool itself will provide an adequate holding force. The actual clamping force will be dependent on the weight of the stool and the workpiece and also the relative distance between the pivot 10 and the jaws 2, 4 and the pivot 10 and the lower ends of the two frames.

The stool described is capable of providing an effective self-clamping action across the length of the work stool by means of a simple pivot mechanism which can be produced inexpensively and does not require a complex screw linkage between the two jaws. The stool can be folded to a reduced volume configuration for storage purposes by pivoting the frame 8 about the pivot 10 so that the lower ends of its legs 8a lie adjacent the legs 6a of the other frame 6.

The edge portion 18a of the platform 18 may include a series of triangular cut-outs of different size to receive pipes or tubes directed vertically, that is perpendicularly to the platform surface, to be clamped against the stop portion 22.

The stool may also be provided with inserts locatable between the two clamping portions 22, 24 to increase the capabilities of the tool. The inserts may include one or more of the following:

a rectangular board-like insert locatable between the fixed clamping portion 22 and the adjustable clamping portion 24 when in its furthest most position in order to form a substantially continuous surface between the outer edges of the two clamping portions - the continuous surface may form a platform on which an operator can safely stand;

removable jaw-like inserts locatable on the platform between the clamping portions and having profiled inner faces or inner faces with cut-outs in order to grip and locate specific articles such as lengths of pipe or conduit extending along the stool parallel to the platform or lengths of pipe, such as sewage pipe extending vertically from the platform with its lower end supported on the platform.

The embodiment shown in Figures 4 and 5 differs from that of Figures 1 to 3 in that the platform 18 of the jaw 2 is itself made adjustable thereby dispensing with the need for the associated adjustable clamping portion 24. The platform 18 is mounted for movement across an upper support 30 forming

part of the frame 6 and extending between the two legs of the frame 6. The platform 18 is supported at its inner edge by brackets 32 mounted to slide along the struts 16 at each end of the work stool. The struts 16 are formed along their upper edges with ratchet teeth 34 and each of the brackets 32 carries a locking pawl 36 pivotally biased by gravitational forces into engagement with the ratchet teeth 34. In this embodiment, clamping of workpieces takes place directly between the edge 18a of the platform and the opposing edge 20a of the stop portion 20 of the jaw 4 and which in this embodiment forms the clamping portion of the jaw 4. The ratchet teeth 34 are oriented to permit the jaw 2 to be moved towards the jaw 4 without releasing the pawls 36 whereby to clamp a workpiece between the clamping edges 18a, 20a. Release of the pawls 36 to permit movement of the jaw 2 in the reverse direction is effected by means of a handle 38 rigid with the pawl 36 and movable upwardly to pivot the pawl out of engagement with the ratchet teeth 34. In operation, with a slight upwards force applied to the struts 16 to slightly open the jaws 2 and 4, a workpiece is positioned between the two jaws and the upwards force then released to permit a self-clamping action as described previously.

This embodiment provides a large and substantially unobstructed work surface for the work horse. The clamping edges 18a, 20a can be profiled to receive lengths of pipe or tubing either horizontally or vertically.

The embodiment shown in Figures 6 to 9 utilises the same self-clamping principle to that of the embodiments described above. In this embodiment the two jaws 40 are substantially symmetrical and the pivot 10 between the two frames 6, 8 is also located symmetrically so as to lie on a central longitudinal plane of the stool. Each leg of the two frames 6, 8 carries a rigid inwardly-directed strut 42, 44 which is bolted or riveted to the strut of the opposing leg of the other frame by a single bolt or rivet whereby to define the pivot 10. Each of the jaws 40 is formed with an outwardly-stepped profile which faces the stepped profile of the other jaw. The two jaws thus provide a series of

opposed workpiece supporting and clamping surfaces 40a, 40b of different widths whereby to receive a range of widths of workpiece. In order to use the work stool, the workpiece is placed symmetrically between the two jaws 40, the stool is lifted slightly so that the two jaws 40 pivot open whereby the workpiece will drop onto the next lower of the supporting surfaces 40a to be firmly clamped between the adjacent vertical clamping surfaces 40b when the jaws 40 are released.

The jaws 40 may each be integrally moulded from a suitable plastics material of suitable strength and durability. Although the jaw configuration is not quite as versatile as that of the previous embodiments, nevertheless it still permits clamping of workpieces of a wide range of different widths. It is envisaged that this embodiment could be manufactured at a lower cost than the previous embodiments.

This embodiment of the work stool can be used with a number of different inserts in order to increase the capabilities of the stool. These inserts include the following:

a rectangular board 46 of a size and thickness to be clamped between the uppermost steps of the two jaws 40 so as to lie flush with the upper surface of each of the two jaws and thereby provide a planar working surface and which could also act as a surface on which an operator can stand;

clip-on metal jaws 48 (Figure 8) of sheet metal pressed to a similar profile so as to slide over the main jaws and possibly having serrated clamping surfaces to improve the gripping action - these slip-on jaws provide a very hard and durable working surface and are replaceable in the event of damage;

clip-on jaws 50 (Figure 9), for example of moulded plastics having an under-surface which matches that of the stepped jaw profile and having opposed gripping surfaces which are shaped to permit clamping of bar

or tubing either horizontally or vertically.

In this embodiment, as with the previous embodiments, the clamping force is determined by the self-weight of the stool itself plus the weight of the workpiece and any downwards pressure which the user may apply to the workpiece or stool. It is also governed by the leverage which arises due to the relative length of the distance between the clamping areas and the pivot axis and the pivot axis and the feet of the legs. The degree of opening movement between the jaws consequent on inwards movement of the two frames 6, 8 one relative to the other will be sufficient to accommodate a workpiece of any width between the narrowest which would be clamped between the two innermost clamping surfaces and the widest which could be clamped between the two outermost clamping surfaces, and in one practical example the stool may be designed to clamp workpieces down to a thickness of about 30 mm.

The self-clamping work stools described herein are able to effectively clamp workpieces without the need for additional clamping devices such as D-clamps or G-clamps so that the workpiece is clear of obstructions. The clamping action is quickly and easily provided and does not involve the use of expensive screw mechanisms or the like. The range of use of the stools can be extended by inserts and the simple rectangular board-like insert enables the stool to be quickly converted into a flat topped stool, when the normal configuration of the jaws does not itself provide this capability.

The embodiments have been described by way of example only and modifications are possible within the scope of the invention.

A preferred embodiment of a vice in accordance with the second invention will now be described with reference to Figures 10 to 12. It is to be understood that the reference numerals used hereinafter refer only to Figures 10 to 12.

The vice shown in the accompanying drawings comprises a main body part 2 adapted to be secured to a bench or other working surface and carrying a stationary jaw 4, and a slidable body part 6 mounted for sliding movement in the main body part 2 and carrying a jaw 8 which can be displaced towards and away from the stationary jaw 4 of the main body part 2 by movement of the slidable body part 6. The main body part 2 comprises a tubular housing 10 of rectangular section open at its front end and closed at its rear end. The main tubular body of the housing 10 can be fabricated from preformed rectangular hollow section steel or from strip steel rolled into rectangular hollow form and welded at the longitudinal seam.

The slidable body part 6 comprises two parallel rails 12 of rectangular section at such a spacing that they can slide within the tubular housing 10, with the outer sides 12a of the rails being closely adjacent to the opposed side walls 10a of the housing 10 so as to be guided thereby during movement into and out of the housing 10, and, the depth of the rails 12 being slightly less than the internal height of the housing 10 in order to provide the required vertical location of the rails 12. The rails 12 are connected at their outer and inner ends by cross members 14, 16 respectively, which retain the rails 12 at the required spacing and form with the rails 12 a rigid slide assembly. Preferably the rails 12 and cross members 14, 16 are integrally constructed, for example as a one-piece casting. The jaw 8 is mounted on a carriage 18 mounted for limited axial movement along the rails 12. The carriage 18 comprises upper and lower body portions 18a, 18b which lie closely adjacent to the upper and lower edges of the two rails 12 whereby to provide accurate vertical location of the carriage 18 relative to the rails and a rearwardly-directed thrust portion 18c which slides closely between the inner surfaces of the two rails 12 to locate the carriage 18 laterally and also to prevent any skewing under the loading applied during clamping. It is also to be noted that the upper surface 14a of the cross member 14 is set below the upper edges of the two rails 12 and a lower surface 18d of the thrust portion 18c. The lower surface 18d of the thrust portion 18c slides along the upper surface 14a of the cross member 14

and this provides additional guidance and location for the carriage 18 during its limited movement relative to the guide rails 12 and also the adjacent surfaces 18d, 14a of the thrust portion 18c and cross member 14 will cooperate to carry vertical thrust generated during clamping of a workpiece between the two jaws 4, 8.

The limited axial displacement of the carriage 18 relative to the rails 12 is achieved by means of a screw 20 journalled at its forward or inner end in the carriage 18 and extending outwardly through a threaded bore in the cross member 14 of the slide assembly. The screw 20 is connected at its outer end to a crank arm 22 which is slidably mounted to provide an adjustable radius of operation for an actuating handle 24, the crank arm 20 itself preferably being constructed of rectangular section material. The screw 20 is only able to provide for limited axial movement of the carriage 18, and hence the jaw 8, relative to the rails 12 in order to provide a tight clamping action with the stationary inner jaw 4. The main movement of the jaw 8 relative to the stationary jaw 4 to set the jaws approximately to the required width is provided by a ratchet action. The ratchet action is provided by forming the upper edges of the two rails 12 with ratchet teeth 26. The ratchet teeth 26 extend from the inner ends of the rails 12 to a position short of the range of movement of the carriage 18 along the rails 12. The ratchet teeth 26 cooperate with a pawl 28 of bar-like form mounted in a slot in the upper part of the tubular housing 10 so as to span the upper edges of the two rails 12. The pawl 28 is mounted for vertical movement between inner and outer transverse guide surfaces 30, 32 formed by the structure of the main body part 2. The pawl 28 is rigidly attached to a release handle 34 which extends across the width of the main body part 2. The weight of the pawl 28 and associated handle 34 is such as to cause the pawl to be gravity-biased downwardly so that its ramped lower surface will engage the ratchet teeth 26. The ratchet teeth 26 and ramped surface of the pawl 28 are so orientated that the slide assembly can slide inwardly past the pawl 28, with the pawl 28 riding over the ratchet teeth 26 during this movement, but that the pawl 28 will prevent outwards movement or

withdrawal of the slide assembly, withdrawal only being allowed when the pawl 28 is released by raising the pawl 28 by lifting of the handle 34.

To set the jaws 4, 8 to the required spacing, the pawl 28 is released by raising the handle 34 whereby the slide assembly with the jaw 8 can quickly be withdrawn to a required distance, a workpiece is inserted in the space between the jaws 4, 8, and the jaw 8 is moved towards the stationary jaw 4 by pushing the slide assembly inwardly, the pawl 28 riding over the ratchet teeth 26 during this movement. Final tightening of the workpiece between the jaws is then achieved by rotating the crank 22 in order to advance the carriage 18 with the jaw 8 inwardly relative to the slide assembly into tight clamping engagement with the workpiece. As will be apparent, as the primary adjustment in jaw spacing is achieved by moving the slide assembly and locking the slide assembly by means of the pawl 28, only a short displacement is required between the carriage 18 and the slide assembly to achieve final clamping. In practice it has been found that effective results can be achieved with a ratchet tooth pitch of about 15 to 20 mm. When a workpiece is clamped between the two jaws 4, 8, the clamping force will be taken by the pawl 28 acting on the ratchet teeth 26 to prevent withdrawal of the slide assembly and also by interaction between the screw 20 and cross member 14 and the downwards thrust of the lower surface 18d of the thrust portion 18c against the upper surface 14a of the cross member 14 of the slide assembly. The pawl 28 which spans the two rails 28 and which bears firmly against the vertical guide surface 32 which extends across the entire width of the main body part 2, will provide a stable anchorage for the slide assembly during clamping.

An important consequence of the configuration described is that the screw 20 does not extend forwardly or inwardly relative to the carriage 18 carrying the movable jaw 8 and in particular does not extend inwardly into the main body part 2 of the vice. Accordingly, the central region of the vice between the two jaws 4, 8 and between the two rails 12 of the slide assembly is open so that a vertically-directed workpiece extending above and below the

jaws can be clamped between the central portions of the jaws 4, 8. In contrast, with conventional vices in which the screw extends between the movable and stationary jaws, clamping of a vertical workpiece extending above and below the jaws can usually only be accomplished at either end of the jaws over a very restricted jaw length. The configuration described also obviates the necessity of providing vices with offset or asymmetric jaws designed to overcome this problem.

The main body part 2 of the vice is preferably mounted on a base plate 40 having a central threaded mounting hole 42 for receiving a mounting bolt 44 whereby to provide a swivel mounting for the vice to permit the vice to be rotated through 360°. Preferably, the upper surface of the tubular housing 10 of the main body part 2 is provided with a rim 46 forming a tray for holding small components such as nuts bolts or screws. The presence of the tray will also reduce the likelihood of the housing 10 being used as an anvil by the user. Preferably, the sides of the tray are also used as vertical guides for the handle 34 of the ratchet 28.

The vice particularly described is of relatively and simple robust construction which permits a quick action sliding movement of the movable jaw relative to the fixed jaw. The ratchet which provides the substantive locking action during clamping is subject only to a gravitational bias such that it will always move into its locking configuration.

Although it is preferred for both of the rails 12 of the slide assembly to be formed with ratchet teeth, satisfactory results may be achieved if only one of the two rails is provided with ratchet teeth. Further, for some applications, one of the two rails 12 could possibly be omitted and the hollow body 10 of the main body part 2 adapted to provide guidance and support for both sides of the single rail. It would also be possible for the pawl to be carried by the slide assembly to co-operate with ratchet teeth on the main body part.

A work bench or stool of the type comprising a work surface defined by two jaws movable one relative to the other to clamp a workpiece between opposed clamping surfaces of the two jaws can be constructed with a clamping mechanism substantially as described herein in order to provide the possibility of rapid movement of one of the jaws towards or away from the other jaw.

The embodiment has been described by way of example only and modifications are possible within the scope of the invention.

CLAIMS:

1. A device for releasably clamping a workpiece, comprising a pair of opposed clamping jaws, characterised by means linking the jaws such that a downwards force on the jaws causes relative movement between the jaws whereby to clamp a workpiece therebetween.

2. A device according to claim 1, characterised in that the means linking the jaws comprises two pivotally interconnected supports each mounting a respective one of the two jaws, each of the supports having a lower end adapted to rest on a support surface, the pivotal interconnection between the supports being such that the lower ends of the supports are displaceable outwardly one relative to the other under a downwards vertical force applied by the self weight of the device and/or by the workpiece and/or by the user whereby to cause the jaws to move one towards the other into a clamping position.

3. A device according to claim 2, characterised in that the lower end of one of the supports includes roller means to facilitate movement of that support along the support surface.

4. A device according to claim 2, characterised in that the device forms a work bench, with the supports being adapted to rest on the ground and at least one of the jaws forms a work surface of the bench.

5. A device according to claim 4, characterised in that the lower end of one of the supports comprises roller means to roll along the ground and the lower end of the other of the supports includes foot means configured to resist lateral movement along the ground.

6. A device according to claim 5, characterised in that the foot means is of convex form to facilitate rocking movement of the said other support on the ground during movement of the jaws into and out of the clamping position.

7. A device according to any one of claims 4 to 6, characterised in that one of the jaws includes an adjustable clamping portion adjustable to a selected distance from an opposed clamping portion of the other jaw.

8. A device according to claim 7, characterised in that the said one jaw defines a substantive work surface of the bench and the said adjustable clamping portion is movable into a selected position across the work surface.

9. A device according to claim 8, characterised by mounting means for mounting the adjustable clamping portion such that the clamping portion is capable of substantially infinite adjustment into a selected clamping position and is capable of adopting a skewed orientation relative to the opposed clamping portion of the other jaw.

10. A device according to any one of claims 4 to 6, characterised in that one of the jaws includes a clamping portion in opposed relation to a clamping portion of the other jaw, and said device further comprises means for slidably mounting said one jaw to position its clamping portion at a selected distance from the opposed clamping portion of the other jaw, and means for locking said one jaw in its selected position.

11. A device according to claim 10, characterised in that the locking means comprises a ratchet and pawl arrangement, the ratchet being releasable from the pawl to permit the said one jaw to be moved rapidly towards the clamping portion of the other jaw.

12. A device according to any one of claims 4 to 6, characterised in that each jaw has a clamping surface of stepped configuration to provide a plurality of clamping portions whereby the opposed clamping portions of the two jaws are spaced by different widths.

13. A clamping device according to any one of claims 4 to 11, characterised in that each support comprises a frame, the jaws are mounted at upper ends of the respective frames, and the two frames are pivotally interconnected by struts extending between the frames generally parallel to the work surface, the struts being rigidly connected to one of the frames and being pivotally connected to the other of the frames.

14. A clamping device according to claim 10, characterised in that each support comprises a frame, the jaws are mounted at upper ends of the respective frames, and the two frames are pivotally interconnected by struts extending between the frames generally parallel to the work surface, the struts being rigidly connected to one of the frames and being pivotally connected to the other of the frames, wherein the means for slidably mounting the said one jaw comprise brackets attached to the said one jaw and slidable along the struts, and the locking means is operative to releasably lock the brackets in selected positions along the struts.

15. A clamping device comprising a body part including a first clamping jaw, a slide assembly carrying a second clamping jaw, the slide assembly being mounted on the body part for rectilinear sliding movement between a closed position in which opposed clamping surfaces of the two jaws are adjacent and an open position in which the opposed clamping surfaces of the two jaws are spaced, one from said slide assembly and body part including a ratchet and the other from said slide assembly and body part including a pawl engagable with the ratchet, the ratchet and pawl cooperating to permit movement of the slide assembly towards the closed position of the two jaws with the pawl riding across the ratchet teeth while precluding movement towards the open position without releasing the pawl, whereby the ratchet and pawl cooperate to permit a rapid course adjustment of the spacing between the two jaws, and screw means for causing relative displacement between the first and second jaws whereby to provide fine adjustment of the spacing, the configuration being such that a substantial clamping zone in the centre portion of the two jaws is

unobstructed from below by the slide assembly and screw means whereby to permit passage of a workpiece vertically through the clamping zone to extend both above and below the clamping zone in the centre portion of the two jaws.

16. A clamping device according to claim 15, characterised in that the second jaw forms part of a carriage mounted for restricted longitudinal movement along the slide assembly and the screw means acts between the carriage and the slide assembly to effect such movement, the carriage being guided by the slide assembly during movement along the slide assembly.

17. A clamping device according to claim 16, characterised in that the slide assembly comprises at least one rail slidably mounted in the main body part to one side of the clamping zone, said rail having ratchet teeth and cooperating with a pawl carried by the main body part.

18. A clamping device according to claim 17, characterised in that the slide assembly comprises a second rail parallel to the first mentioned rail and spaced therefrom to the other side of the clamping zone such that the area defined between the two rails is open from above and from below.

19. A clamping device according to claim 18, characterised in that the main body part comprises a housing of rectangular hollow section having opposed side walls and opposed upper and lower walls, and the rails of the slide assembly engage within the section to be guided by the respective side walls and the upper and lower walls.

20. A clamping device according to claim 18 or claim 19, characterised in that both of said rails have ratchet teeth on their upper edges, and the pawl is gravity-biased into engagement therewith.

21. A clamping device according to claim 20, characterised in that the pawl comprises a bar slidably mounted on the main body part to span across the toothed upper edges of the rails.

22. A clamping device according to any one of claims 18 to 21, characterised in that the slide assembly comprises a cross member connecting the outer ends of the two rails remote from the main body part, and the screw means comprises a screw journalled at an inner end to the carriage and extending in threaded engagement with the cross member, said screw carrying a handle at its outer end, the screw extending parallel to and between the two rails and terminating at its inner end at the carriage whereby to maintain the zone between the carriage and the main body part unobstructed from above and below.

23. A clamping device according to claim 22, characterised in that the carriage comprises a thrust portion outwardly of the second jaw, said thrust portion having a downwardly-facing surface which slides over and co-operates with an upwardly-facing surface of the cross member to carry forces during clamping.

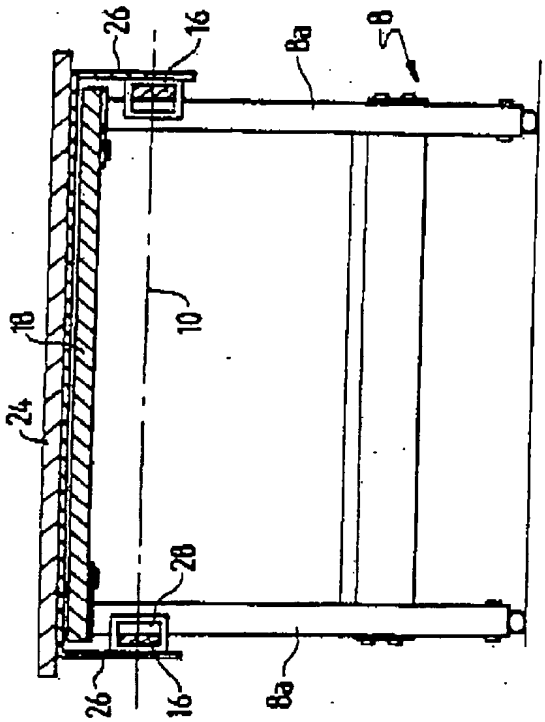


FIGURE 2

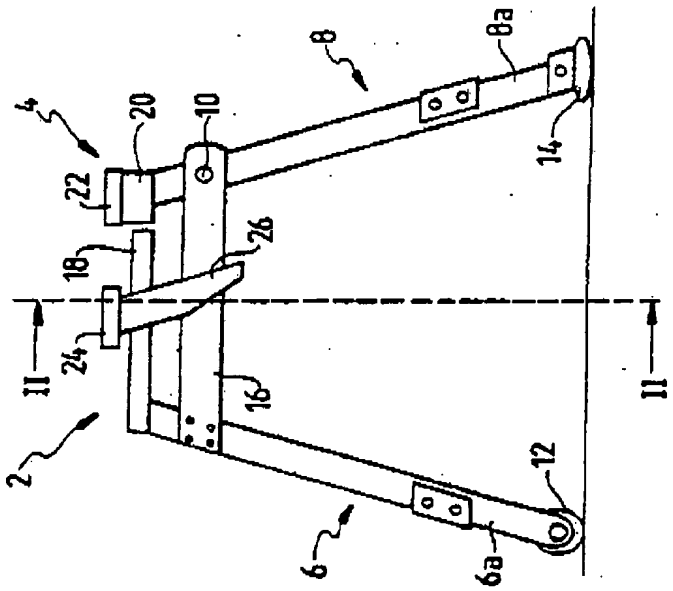


FIGURE 1

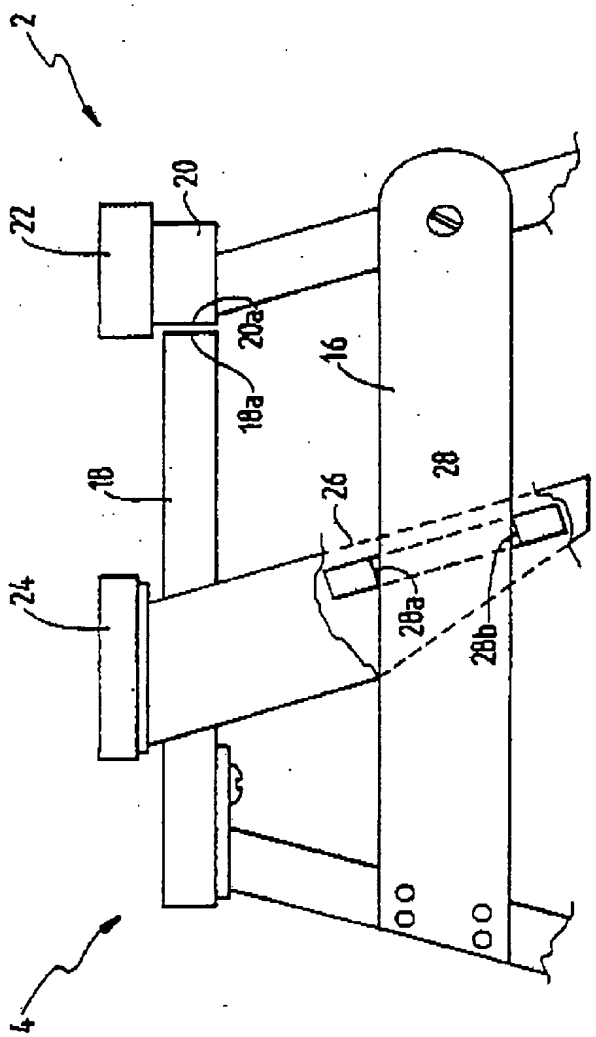
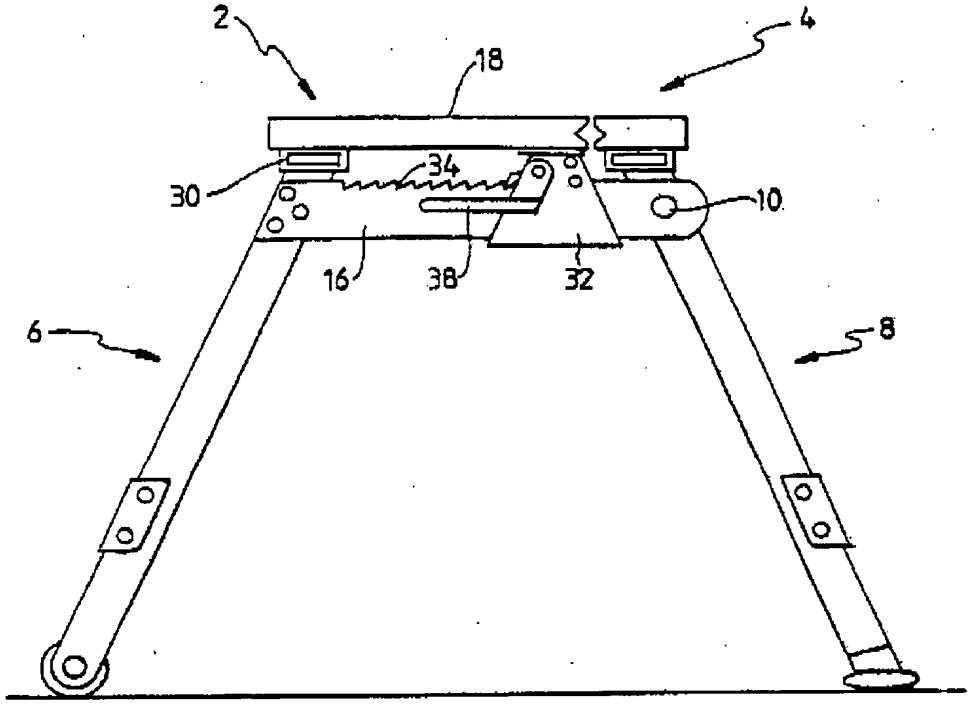


FIGURE 3



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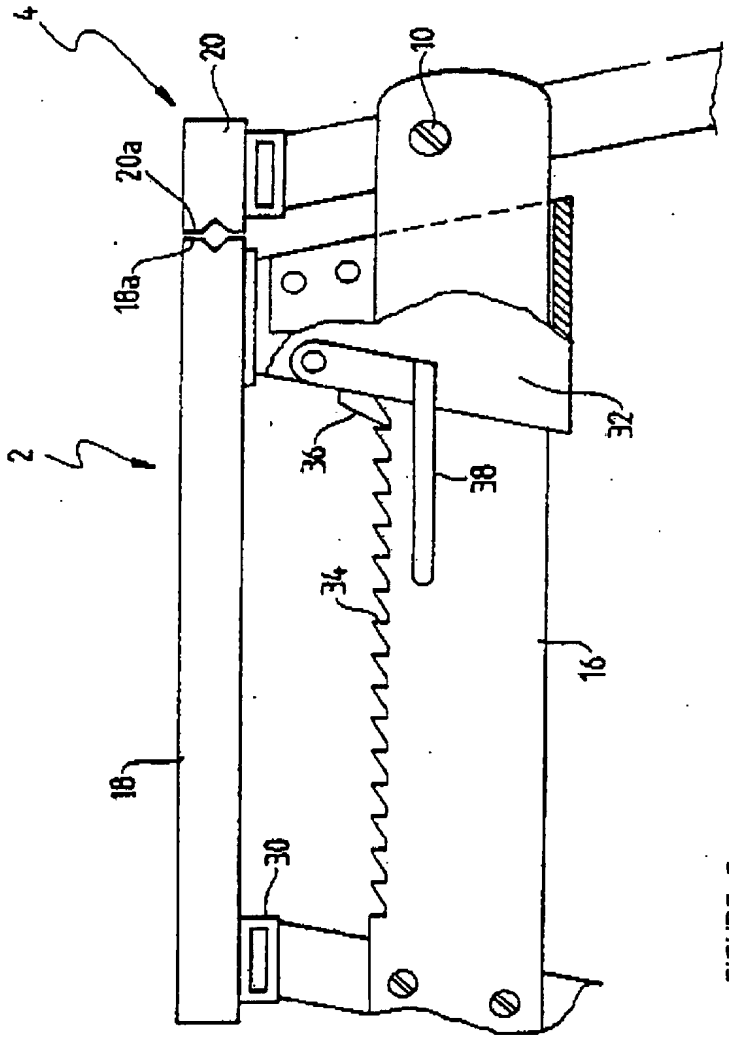

FIGURE 5

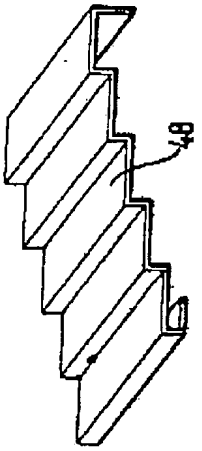

FIGURE 8

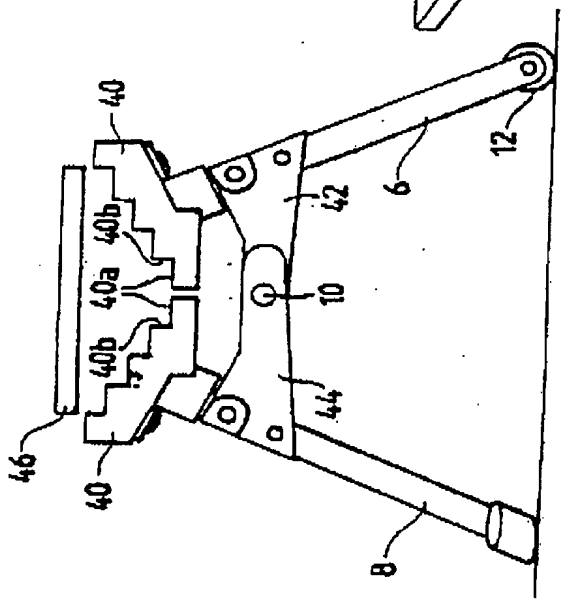

FIGURE 6

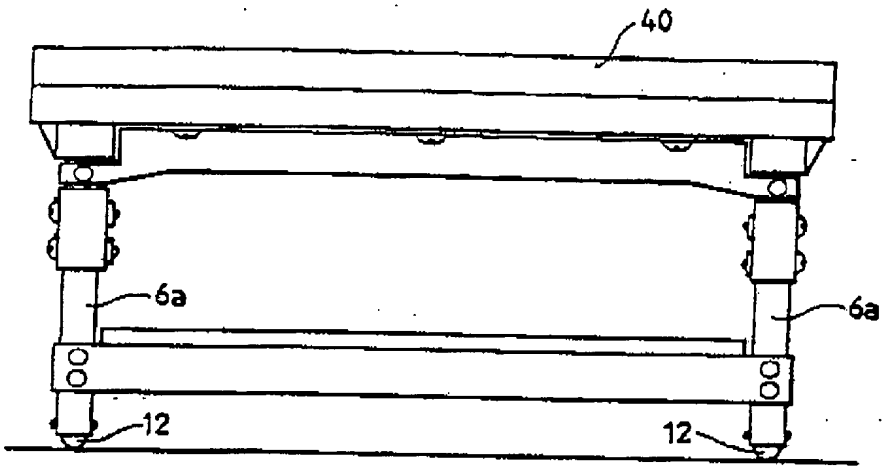

FIGURE 7

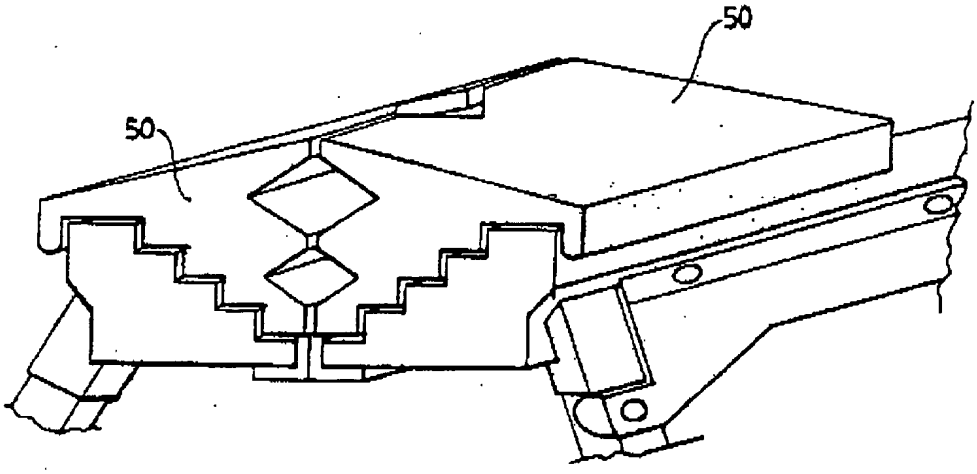

FIGURE 9

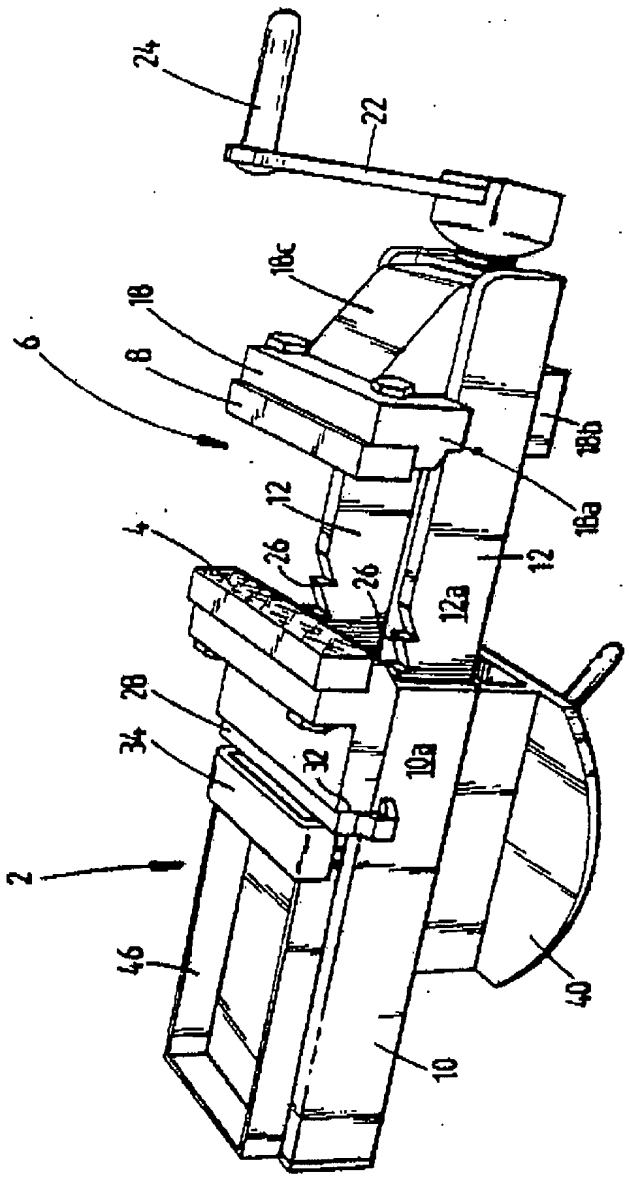

FIGURE 10

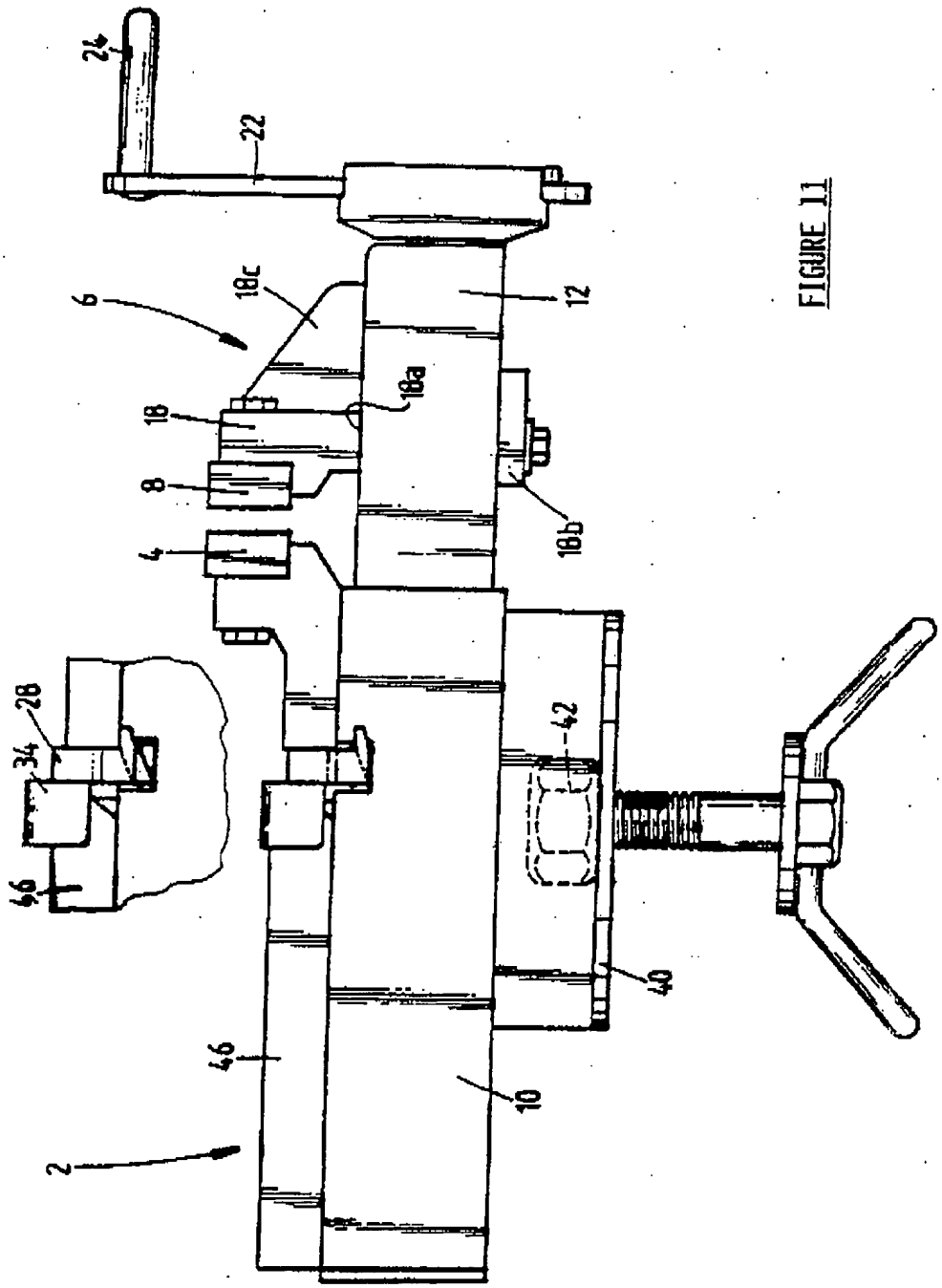

FIGURE 11

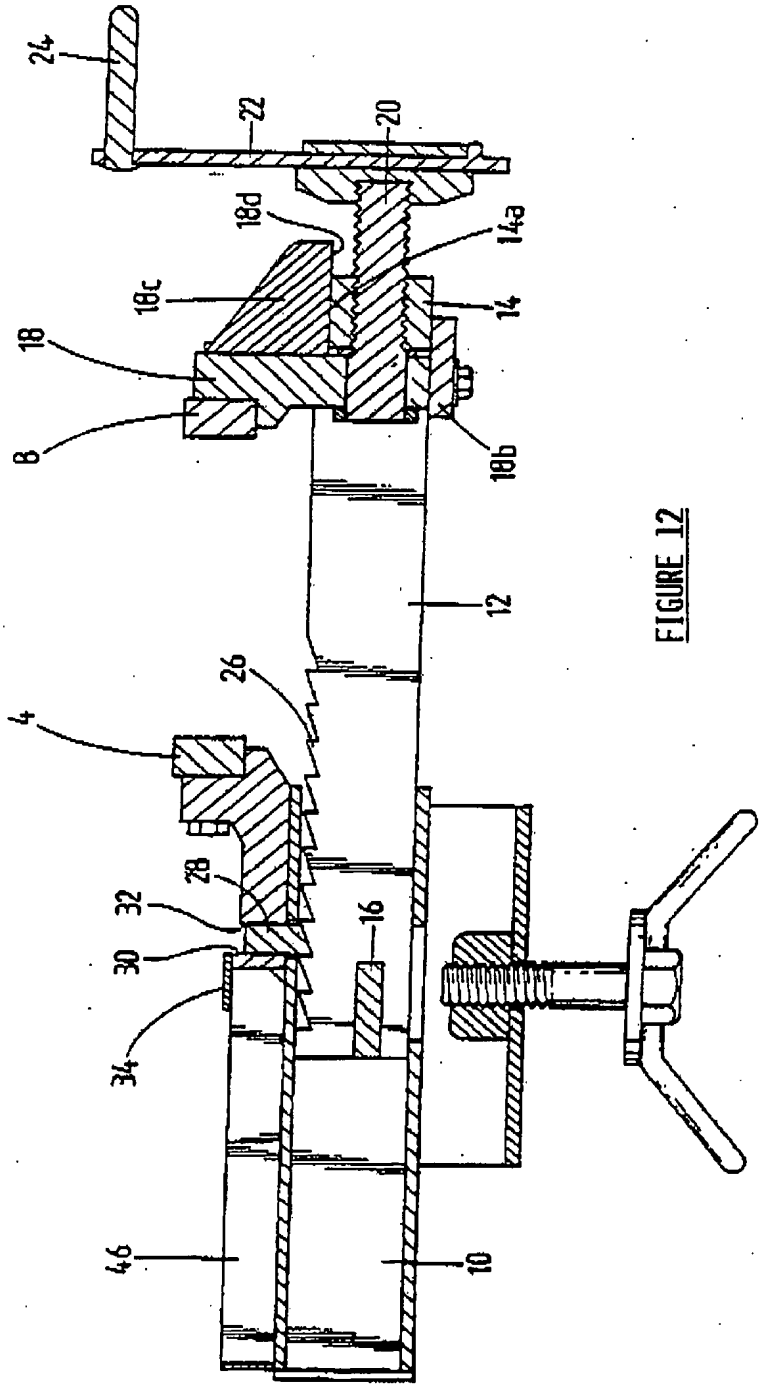

FIGURE 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU92/00459

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl.[5] B25B 1/06, 1/10; B25H 1/04, 1/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC B25B 1/02, 1/06, 1/10, 1/24, 11/00; B25H 1/00, 1/04, 1/06, 1/08, 1/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	NL,A, 7709879 (TEN CATE AFB) 12 March 1979 (12.02.79) Abstract, Figures 4 and 7.	1-6
X	EP,A, 40047 (GOSS) 18 November 1981 (18.11.81) Page 3, line 30 to page 4, line 32, Figures 1 and 2.	1-6
X	US,A, 1446309 (KROHNE) 20 February 1923 (20.02.23) Page 1, lines 71-78, Figure 1.	1

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 November 1992 (30.11.92)	3 Dec. 1992 (03.12.92)
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929	Authorized officer D.G. FRY Telephone No. (06) 2832130

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU92/00459

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	DT,A, 2336148 (FRITZMEIER KG) 6 February 1975 (06.02.75) Figures 1 and 3.	1
X	CH,A, 124387 (ALTHAUS) 1 February 1928 (01.02.28) Pages 1-2, Figure 1.	15-18
X	DE,A, 470452 (GERK) 16 January 1929 (16.01.29) Page 1, Figure 1.	15-18
X	DE,A, 456434 (GERK) 23 February 1928 (23.02.28) Page 2, Figure 3.	15-18
X	GB,A, 184899 (BROOKER MFG CO LTD) 24 August 1922 (24.08.22) Page 2, lines 15-30, Figure 1.	15-17
X	CH,A, 115988 (SPUHLER) 2 August 1926 (02.08.26) Entire Document.	15-23
X	US,A, 2511843 (GRAETHER) 20 June 1950 (20.06.50) Columns 2-4, Figures 1 and 2.	15-21

INTERNATIONAL SEARCH REPORT
Information on patent family membe .

International application No.
PCT/AU92/00459

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
EP 40047	GB 2078595 JP 56163883
	END OF ANNEX